

BROOKHAVEN NATIONAL LABORATORY

SBMS Interim Procedure

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Title: Facility Risk Analysis (FRA)

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Management System: Facility Safety

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Applicability: Plant Engineering Division, Central Shops Division, Collider-Accelerator Department and ESHQ Directorate

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1. Purpose

- 1.1. This procedure establishes a standard method for developing, using and maintaining Facility Risk Analyses (FRA) forms that will meet the requirements of OHSAS 18001 Clause 4.3.1.

2. Definitions

- 2.1. Area-Specific Analysis – Area specific risk analysis are used to assess the majority of safety topics that exist within a given type of operational area or given type of operational room within a facility. For example, welding and brazing areas. Safety topics will likely be common to a specific area type. That is, if more than one area of the same type exists within a facility, then a single risk analysis is appropriate.

- 2.2. Control – in this context, a control is any engineered system, protective equipment or administrative arrangement that eliminates a hazard or reduces its likelihood of causing an injury or illness.
- 2.3. Occupancy or Use – the rate at which a specific area is occupied or item is used. There are five classes of occupancy or use: less than or equal to once per year, less than or equal to once per month, less than or equal to once per week, less than or equal to once per shift and greater than once per shift.
- 2.4. Facility-Wide Analysis – Some hazards may arise from activities or tasks not associated with a specific job. The facility itself and its general operations present certain exposures to hazards. For example, electrical equipment, access and egress, fire hazards, heat or cold conditions, tripping hazards, noise exposures, radiation exposures and chemical exposures. These types of hazards are addressed with a facility-wide risk assessment.
- 2.5. Hazard - a source of danger; a possibility of incurring loss or misfortune; "radiation is a health hazard."
- 2.6. Likelihood – the chances of an event that leads to bad consequences. The five classes of likelihood are: impossible, unlikely, possible, probable, and multiple. An event might be a slip or fall, unanticipated radiation, a dropped load from a forklift, etc.
- 2.7. Risk – in this context, risk is the product of the occupancy, likelihood and severity. Points for occupancy, likelihood and severity are based on a stepwise numerical system developed by Liberty Mutual Company. A specific range of point values for risk is associated with one of five descriptive classes of risk: negligible, acceptable, moderate, substantial and intolerable.
- 2.8. Severity – the bad consequences of an event. The five classes of severity are: first-aid, medical treatment, lost time, partial disability, and death or permanent disability.

3. Responsibilities

- 3.1. The Departmental/Divisional OSH Management Representative is responsible for ensuring that each relevant facility or area has a current assessment of the occupational safety and health hazards and risks. All significant risks must be adequately addressed. The assessment may be done by a variety of means. An example would be to assemble a team of managers, supervisors, workers and ESH professionals to perform the assessment.
- 3.2. The Departmental/Divisional OSH Management Representative or his/her designate shall approve each facility or area risk assessment. In addition, the OSH Management Representative is responsible for assuring all new and modified facilities and activities have a FRA performed prior to operations.

4. Scope

- 4.1. OHSAS Clause 4.3.1 provides no instructions, guidelines or limitations on how to identify areas and facilities that may present health and safety hazards. Generally, it is recommended that all areas and facilities that may present hazards to the worker be considered for risk analysis. Remember to include areas or facilities used by non-employees.

5. Procedure

5.1. Review of Facility and Area Hazards and Risks

- 5.1.1. Develop a complete listing of all facilities and areas in use in your Division/Department. Use the example facility-wide analysis and area-specific analysis list shown in Table 1.
 - 5.1.1.1. Make a “rough draft” estimate of hazards and risks for each area or activity on the list. See column four of Table 1. Look for hazards that are obvious and risks that are clearly serious.
 - 5.1.1.2. Develop priorities based on previous experience, information on known physical items in the area that present hazards, and the occupancy of employees in the area. Draw on the personal experience of your risk assessment team. Key operational personnel may be aware of hazards that are not apparent from injury records. Their insights will help you set priorities, as well as identify additional hazards. New constructed areas that have no history should be examined carefully to establish a preliminary priority.

Table 1 Strategy to Determine the Priority of Facility Risk Assessments

Area or Activity	Description	Priority	Reason
Facility-Wide Analysis			
General Electrical Issues	Standard electrical installations and activities throughout the facility	Medium	Minor shocks have occurred the last few years from legacy wiring. Overheating occurs occasionally due to the inventory of components. Some open ATS items related to improving electrical safety. Many OSHA violations found by OSHA Team.
General Fire Issues	General fire protection throughout the facility; cover special areas separately	Medium	Fire protection systems are old but operable. Upgrades are needed and ADS forms are outstanding and awaiting funding. Fires are possible significant programmatic problems. Minor fires have occurred in the last few years. FHAs are currently being revised for C-AD facilities. BNL only had a single FP Engineer for many years until end of 2004.
General Radiation Issues	General radiation protection issues throughout the facility	Low	In general, radiation is not a significant health risk but is a compliance issue. Access controls provide protection against high hazard radiation.
General ODH Issues	General oxygen deficiency issues throughout the facility	Low	ODH analyses have provided a good approach to worker safety in the newer facilities.
General Housekeeping Issues	General housekeeping issues throughout the facility	Medium	Work is sometimes finished without area cleanup completed. Causes restricted walkways, slip hazards, increased fire loading. Tier 1 inspections cite this numerous times. Many OSHA findings related to housekeeping.
General Noise Issues	General noise issues in and around mechanical equipment rooms and compressor facilities	Medium	Some workers have been assessed by the Medical Clinic to have hearing losses not associated with normal aging. Community concerns near the BNL site have been recently addressed to reduce the compressor noise at RHIC.
Area-Specific Analysis			
Cryogenic Refrigerator Room	1005R for RHIC He expansion as part of the refrigeration process	Medium	ODH 1 area. A lot of equipment under pressure. Cryogenic fluids. High ambient temperature in building in warm weather.
Cryogenic Compressor Room	1005H for RHIC He compression as part of the refrigeration process	Medium	High pressure helium. Highest noise levels of all C-AD facilities.
He Reliquifier	1005E for conversion of He gas to liquid for storage	Low	Recently reviewed by ASSRC.
Shops	Mechanical and electrical maintenance	Medium	Recent injuries. Improved training on machine operations is needed.

Offices	General offices with computer usage	Medium	Ergonomic injuries have been experienced.
STAR	RHIC experiment	Low	Reviewed by ESRC annually. Experimenter injury rates are extremely small.
PHENIX	RHIC experiment	Low	Reviewed by ESRC annually. Experimenter injury rates are extremely small.
PHOBOS	RHIC experiment	Low	Reviewed by ESRC annually. Experimenter injury rates are extremely small.
BRAHMS	RHIC experiment	Low	Reviewed by ESRC annually. Experimenter injury rates are extremely small.
NSRL	NASA Experimental Building	Low	Reviewed by ESRC annually. Experimenter injury rates are extremely small.
Building 912/U-Line/g-2	AGS experiments	Medium	Roof leaks causing walking/working surface issues. A lot of work is taking place such as decommissioning of old beam lines in preparation for future experiments.
Warehouses/storage facilities	Storage of materials and movement of materials	Low	Not a lot of material movement.
Equipment Testing Areas	Permanent testing locations for C-AD equipment	Medium	Test areas have not been specifically reviewed in the recent past.
EBIS	Building 930A	Medium	Not reviewed in detail for a few years.
eCooler	Building 939	Low	Recent reviews by ASSRC and RSC.
Waste Yard	Building 960 area	Low	No injuries in recent past.
90-Day Area/Satellite Areas	Various locations	Low	No injuries in recent past.
Accelerators	Booster, AGS	Low	No injuries in recent past.
Preinjectors	Linac. Tandem	Low	No injuries in recent past.
Collider	RHIC tunnel and service/support buildings	Low	No injuries in recent past.
Locked Electrical rooms/Locked Electrical Caged Areas	930B, 1005E, 1007W, 928 basement, 919B, 911B relay room	Low	No injuries in recent past.
Siemens and Westinghouse Motor Generator Sets	928 and 911	Low	No injuries in recent past. Siemens motor generator set had recent massive mechanical failure.

5.2. Performing the FRA

5.2.1. BNL requires that Departments and Divisions use the data entry form in Table 2 to record the information gathered from the FRA process.

5.2.2. Use the following eight steps to perform FRA:

- describe the physical items or activities present in the area or facility
- identify the hazards associated with each physical item; there should be only one hazard listed in each row of the Table 2, however there can be as many rows as needed
- identify controls in place for each hazard
- estimate the Occupancy or Use of the area or facility using the information in the shaded area of Table 2
- estimate the potential Severity of an accident associated with each hazard
- estimate the Likelihood or chances of an injury for each hazard (given existing controls) using the information in the shaded area of Table 2
- identify possible additional controls needed for these hazards
- re-estimate the risk and the % risk reduction if controls are added

5.2.3. Model your FRA after the practical example that is shown in Table 3.

NOTE

Each hazard should occupy one line in the risk table. That is, the risk from each hazard is to be assessed individually. A single activity like “welding, soldering or brazing” must be entered three times in the table since there are three hazards associated with this activity, which are UV exposure, burns and fires. See the example in Table 3.

5.2.4. Classify the risk of each safety issue using the BNL risk information identified in the bottom of Table 2.

5.2.5. Any safety issue with risk identified as “intolerable” must be investigated and abated immediately. Unless specific exception is granted by the Department Chair / Division Head, work in the area will be suspended until the risk can be re-classified as no greater than “substantial.”

5.2.6. Risks identified as “substantial” will require development and implementation of a written remedial action program.

5.2.7. Risks identified as “moderate” or below shall be addressed through the Department’s/Division’s normal OSH Management System objective-setting and planning processes.

5.3. FRA Results

5.3.1. As indicated in OHSAS 18001 Clause 4.3.1, use the FRA process to help determine:

- facility requirements for new, modified and existing facilities
- training needs
- development of controls

5.3.2. The FRA process must include some means of monitoring improvement actions added to reduce risk in order to ensure that actions are implemented on time and are effective. The use of the Family Action Tracking System (ATS) or equivalent is an acceptable system for this purpose.

5.3.3. Additionally, your Department/Division must consider the results of the FRA process and effects of controls when establishing annual OSH objectives. Facilities where injuries and illnesses have occurred during the year, as well as risk levels in the Substantial category, should be considered when setting annual OSH objectives.

5.4. Annual FRA Review

5.4.1. On an on-going basis, the OSH Management Representative is responsible for scheduling annual reviews of FRAs. The purpose of such reviews is to ensure the FRAs reflect the condition of current work areas at the site.

5.4.2. The OSH Management Representative will assign a team to review facility and area hazards and risks annually.

5.4.3. The team will base its intensity of review of a particular facility or area on the level of risk assigned to hazards in prior FRAs.

5.5. FRA in Response to Accidents, Incidents, Non-Conformances, Corrective and Preventative Actions

5.5.1. As necessary, the OSH Management Representative shall schedule and assign appropriate personnel to conduct or update a FRA in conjunction with a Critique, Occurrence, near miss or non-conformance involving an injury associated with a facility or area hazard.

5.6. Area or Facility Changes

5.6.1. The OSH Management Representative shall schedule and assign appropriate personnel to review all changes and modifications to a facility. Where hazards have been introduced or remediated, they shall conduct a FRA of the area or facility under the Department's/Division's purview.

Name(s) of Risk Team Members:			Point Value → Parameter ↓	1	2	3	4	5						
Area/Facility Description Title: Area/Facility # (if applicable):			Occupancy or Use (A)	≤once/year	≤once/month	≤once/week	≤once/shift	>once/shift						
Area/Facility Description:			Severity (B)	First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability						
			Likelihood (C)	Impossible	Unlikely	Possible	Probable	Multiple						
Approved by:		Date:	Rev.#:				Comments:							
Reason for Revision (if applicable):														
			Risk with Controls in Place							Risk with Additional Controls in Place				
Physical Item or Activity	Hazard(s)	Control(s)	Occupancy A	Severity B	Likelihood C	Risk* AxBxC	Control(s) Added to Reduce Risk			Occupancy A	Severity B	Likelihood C	Risk* AxBxC	% Risk Reduction
Further Description of Controls Added to Reduce Risk:														
*Risk:	0 to 20		21 to 40		41-60			61 to 80			81 or greater			
	Negligible		Acceptable		Moderate			Substantial			Intolerable			

Table 3 Example BNL Facility or Area Risk Assessment Form																	
Name(s) of Risk Team Members: E. Lessard, R. Karol, J. Scott			Point Value → Parameter ↓		1		2		3		4		5				
Area/Facility Description Title: C-AD Area Specific Shops Hazards			Occupancy or Use (A)		≤once/year		≤once/month		≤once/week		≤once/shift		>once/shift				
Area/Facility # (if applicable): All shops																	
Area/Facility Description: Shops include vacuum labs, machine shops and tech shops.			Severity (B)		First Aid Only		Medical Treatment		Lost Time		Partial Disability		Death or Permanent Disability				
			Likelihood (C)		Impossible		Unlikely		Possible		Probable		Multiple				
Approved by: <i>E. Lessard</i>			Date: 4-16-04			Rev. #: 1											
Reason for Revision (if applicable): Welder’s helper suffered arc eye when wearing normal UV safety glasses; UV entered eye from edge of glasses									Comments:								
					Risk with Controls in Place							Risk with Additional Controls in Place					
Physical Item or Activity	Hazard(s)	Control(s)			Occupancy A	Severity B	Likelihood C	Risk* AxBxC	Control(s) Added to Reduce Risk			Occupancy A	Severity B	Likelihood C	Risk* AxBxC	% Risk Reduction	
Machining activated materials	Ionizing radiation exposure	Shielding, fencing and barrier inspection, radiation surveys, facility specific training, formal job assessments, procedure, work planning Rad Worker Training, ALARA Committee review			2	1	3	6									
Processing materials, working with chemicals, plating	Hazardous or toxic materials exposure	Training for hazardous waste handling, Hazard Communication training, specific-hazard training such as for Be or asbestos handling, inventory controls			4	4	3	48									
Working with compressed air	Vessel pressure, force of air on body	PPE such as face shields, eye guards, ear plugs, gloves, aprons, overalls			3	3	3	27									
Machining materials	Caught in / entangled in high speed rotating machinery	Equipment-specific training, blade guards, PPE such as face shields, eye guards, ear plugs, gloves, aprons, overalls			3	5	3	45									
Welding, soldering or brazing	UV radiation	Work planning, welding training, barricades, face shields for welders, safety glasses for helpers			5	3	4	60	Requirements changed to require helpers wear goggles instead of safety glasses for better UV protection			5	2	3	30	50%	
Welding, soldering or brazing	Burns	Work planning, welding training, gloves			5	2	2	20									
Welding, soldering or brazing	Fires	Work planning, welding training, fire watch			5	3	2	30									
Further Description of Controls Added to Reduce Risk:																	
*Risk:	0 to 20		21 to 40		41-60				61 to 80				81 or greater				
	Negligible		Acceptable		Moderate				Substantial				Intolerable				